

REMARKS

Claims 1-17 are pending in this application. By this Amendment, claims 1, 4, and 8 are amended. The amendments to the claims are made for clarity. No new matter is added.

The courtesies extended to Applicants' representative by Examiner Bryant at the interview held July 7, 2010 are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below, which constitute Applicants' separate record of the interview.

In view of the foregoing amendments and the following remarks, reconsideration and allowance of the claims are respectfully requested.

I. Rejections Under 35 U.S.C. §112

The Office Action rejects claims 1-17 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite. Applicants respectfully traverse the rejection.

Specifically, the Office Action asserts: the empirical relationship set forth in the claims incorporates a non-feasible range; that the phrase "may lie in the range" renders the claims indefinite; that the feature "the same sublattice" has insufficient antecedent basis; and the feature "the spinel structure" has insufficient antecedent basis. *See* Office Action, pages 2-3.

Without conceding the propriety of the rejection, claims 1, 4, and 8 are amended to obviate the rejection. The remaining claims are rejected based solely on their dependence from claims 1, 4, and 8 and, thus, the amendments to claims 1, 4, and 8 also obviate the rejections as to the remaining claims. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

II. Rejections Under 35 U.S.C. §103

A. Endo And Torii

The Office Action rejects claims 1-5, 8, 9, and 12 under 35 U.S.C. §103(a) over U.S. Patent No. 5,962,854 to Endo ("Endo") in view of Torii et al., "Chemical Processing and Characterization of Spinel-Type Thermistor Powder in the Mn-Ni-Fe Oxide System," Journal of Materials Science, Vol. 31, pp. 2603-2607 (1996) ("Torii"). Applicants respectfully traverse the rejection.

Claim 1 recites, *inter alia*:

A method of bolometric detection of infrared radiation, comprising ... detecting the infrared radiation by using the sensitive material, the sensitive material having a spinel ferrite structure of chemical composition, ignoring doping agents if any are present, satisfying empirical formula I: (I)
 $\text{Fe}_{3-(x+y)}\text{M}_x\text{A}_y\text{O}_{4+\delta}$ in which iron is the majority metallic element

Claims 4 and 8 recite similar features. Endo and Torii, individually or in combination, would not have rendered obvious at least the above features of claims 1, 4, and 8.

The Office Action asserts, on page 4, that Endo discloses an apparatus and method for bolometric detection of infrared radiation allegedly comprising many of the components recited in claims 1, 4, and 8. The Office Action further asserts that Endo discloses using a Mn-Ni-Co-oxide thermistor material. However, the Office Action acknowledges that Endo does not disclose a spinel ferrite thermistor material. *Id.* To address this discrepancy of Endo, the Office Action applies Torii.

The Office Action asserts that Torii discloses ferrite-based spinel thermistors having a formula of $\text{Ni}_x\text{Fe}_y\text{Mn}_{3-x-y}\text{O}_4$. The Office Action concludes "In view of the negative temperature coefficient and stable structure of ferrite spinel thermistor taught by Torii, it would have been obvious to one of ordinary skill in the art to use in the apparatus of method

[sic] of Endo at the time of the invention." Office Action, page 4. Applicants respectfully disagree.

Neither Endo nor Torii disclose a material with a spinel ferrite structure at least because Endo does not disclose using iron at all, and Torii does not disclose that "iron is the majority metallic element," as recited in claims 1, 4, and 8. Rather, both references disclose the use of manganites as thermistors. It would not have been obvious to one of ordinary skill in the art to have exchanged the manganite thermistor with a spinel ferrite thermistor, for at least the reasons presented below.

In order for a material to be used as a sensitive material in a bolometric detector, the material must have thermistor properties, such as an electrical resistance that varies with temperature. Thus, a material that can act as an efficient thermistor must have good sensitivity or, in other words, the material to be used as sensitive material must exhibit a large variation in resistivity as a result of a small variation in temperature. One of ordinary skill in the art would have known that the sensitivity of a thermistor is expressed through energy constant "B." This constant "B" represents an intrinsic property of the evaluated material and is commonly provided by industrial suppliers. As explained in the specification (on page 10, line 34 - page 21, line 21) the constant "B" may be expressed by the following formula from two resistances, R1 and R2, measured respectively at temperatures T1 and T2:

$$B = \frac{T_1 \times T_2}{T_2 - T_1} \ln\left(\frac{R_1}{R_2}\right)$$

Industrial suppliers generally provide mean values of "B" where T2 = 298.15K and T1 = 358.15K. Thus, even industrial suppliers recognize the importance of the resistivity compared to temperature in materials that are to be used in thermistors.

However, the value of "B" for ferrites and the value of "B" for manganites are very different. It is known that ferrites have relatively low values for "B," such as around 1300K for Fe_3O_4 . In contrast, manganite-based thermistors have much higher "B" values, such as from 3000K to 5000K.

Thus, one of ordinary skill in the art would have had no reason or rationale to have replaced the high "B" constant manganite-based material disclosed in both Endo and Torii with a lower "B" constant ferrite-based material in a thermistor film, at least because of the reduced sensitivity of ferrite-based materials compared to manganite-based materials.

Additionally, in spinel ferrite structures with Fe^{2+} , the ions may oxidize in Fe^{3+} , which may lead to a resistance time drift. Thus, one of ordinary skill in the art would not have thought to have replaced a manganite-based material, as disclosed in both Endo and Torii, with spinel ferrite materials because of this expected resistance time drift. Thus, one of ordinary skill in the art searching for a new sensitive material for bolometric detection would have had no reason or rationale to have modified the manganite-based materials in Endo and Torii to have included spinel ferrite-based materials, as recited in claims 1, 4, and 8, with any reasonable expectation of success.

Further to the arguments presented above, although the thermal sensitivity of a material to be used in a thermistor is one property to consider, it is not the sole property that dictates a material's usefulness in a thermistor. For example, the material must also be capable of being deposited as a thin film, should not require any heat treatment after deposition, should have mechanical properties compatible with the integration of the sensitive layer, and in particular should have a very low electronic 1/f noise, which is a particularly important feature. The electronic 1/f noise depends upon many factors, including the material's microstructure (such as size of the grains), number and specificities of the grain boundaries, defects, etc. Neither Endo nor Torii provide any reason or rationale for one of

ordinary skill in the art to have expected that modifying the manganite-based material disclosed in those references to be a spinel ferrite-based material would have maintained and/or provided a material with both the thermal sensitivity as well as the additional features, such as low electronic 1/f noise, required for a thermistor material.

For at least the reasons presented above, claims 1, 4, and 8 would not have been rendered obvious by Endo and Torii, individually or in combination. The remaining claims variously depend from claims 1, 4, and 8 and likewise would not have been rendered obvious. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Endo, Torii, Tu and Fujii

The Office Action rejects claims 6, 7, 10, 11, and 13-16 under 35 U.S.C. §103(a) over Endo in view of Torii and further in view of U.S. Patent No. 5,821,598 to Tu et al. ("Tu"); and rejects claim 17 under 35 U.S.C. §103(a) over Endo in view of Torii and further in view of U.S. Patent No. 6,475,604 to Fujii ("Fujii"). Applicants respectfully traverse the rejections.

For at least the reasons stated above, claims 1, 4, and 8 would not have been rendered obvious by Endo and Torii, individually or in combination. Tu and Fujii do not address, and are not applied to address, the discrepancies of Endo and Torii as to claims 1, 4, and 8. Accordingly, Endo, Torii, Tu and Fujii, individually or in any combination, would not have rendered obvious each and every feature of claims 1, 4, and 8.

Claims 1, 4, and 8 would not have been rendered obvious by Endo, Torii, Tu and Fujii, individually or in any combination. The remaining claims variously depend from claims 1, 4, and 8 and likewise would not have been rendered obvious. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachment:
Petition for Extension of Time

Date: July 26, 2010

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